

**HEWLETT-PACKARD**

# 205AG

## AUDIO SIGNAL GENERATOR

SERIALS PREFIXED: 012 -

OPERATING AND SERVICING MANUAL





OPERATING AND SERVICING MANUAL

# MODEL 205AG/AGR

SERIALS PREFIXED: 012 -

## AUDIO SIGNAL GENERATOR

Copyright      HEWLETT-PACKARD COMPANY      1955  
1501 PAGE MILL ROAD, PALO ALTO, CALIFORNIA, U. S. A.



## SPECIFICATIONS

## FREQUENCY RANGE:

20 cps to 20 kc in three decade bands:

X1	20 cps	to	200 cps
X10	200 cps	to	2 kc
X100	2 kc	to	20 kc

Calibration covers approximately 270 degrees on 6 inch diameter main dial.

## CALIBRATION ACCURACY:

Within  $\pm 2\%$  at normal ambient temperatures. (Includes warm-up and changes due to aging of tubes and components.)

## OUTPUT:

5 watts maximum into resistive loads of 50, 200, 600 and 5000 ohms. Output circuit is balanced and center tapped -- any terminal may be grounded.

## FREQUENCY RESPONSE:

$\pm 1$  db 20 cps to 20 kc at output levels up to +30 dbm with output meter reading held at +37 db,  $\pm 1.5$  db 20 cps to 20 kc at output levels above +30 dbm with output meter reading held at +37 db (reference 1000 cps).

## DISTORTION:

Less than 1% at frequencies above 30 cps.

## INTERNAL IMPEDANCE:

Approximately  $1/6$  load impedance with zero attenuator setting. Approaches load impedance with attenuator settings of 20 db or more.

## HUM LEVEL:

More than 60 db below the output voltage or 90 db below zero level (1 mw, 600 ohms), whichever is the larger.

## OUTPUT METER:

Calibrated in volts and dbm (0 dbm = 1 mw, 600 ohms). Full scale values 65 volts, 37 dbm. Reads on 600 ohm basis regardless of output impedance selected.

## OUTPUT ATTENUATOR:

Provides 110 db in 1 db steps.

## INPUT METER:

Calibrated in dbm (0 db = 1 mw, 600 ohms) from -5 to +8 dbm and in volts from 0 to 2 v rms. Voltage accuracy is  $\pm 5\%$  of full scale.

## INPUT ATTENUATOR:

Extends meter range to +48 dbm and to 200 v rms in 5 db steps. Accuracy  $\pm 0.1$  db.

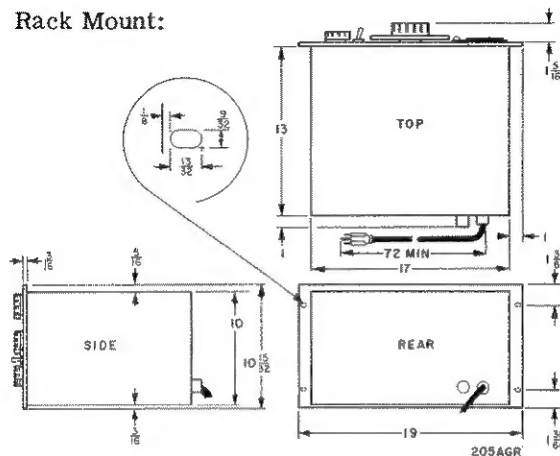
## POWER SUPPLY:

115/230 volts  $\pm 10\%$ , 50-1000 cps, 150 watts.

## DIMENSIONS:

Cabinet Mount: 20-3/4 in. wide, 12-3/4 in. high, 15-1/2 in. deep.

## Rack Mount:



## WEIGHT:

Cabinet Mount: 56 lbs, shipping weight 78 lbs.  
Rack Mount: 49 lbs, shipping weight 71 lbs.

# TABLE OF CONTENTS

Section	Page	Section	Page
I GENERAL DESCRIPTION . . . . .	I-1	IV MAINTENANCE . . . . .	IV-1
1-1 General . . . . .	I-1	4-1 Cabinet Removal . . . . .	IV-1
1-2 Inspection . . . . .	I-1	4-2 Tube Replacement . . . . .	IV-1
II OPERATING INSTRUCTIONS . . . . .	II-1	4-3 Distortion . . . . .	IV-1
2-1 Controls and Terminals . . . . .	II-1	4-4 Capacitor Drive Lubrication . . . . .	IV-1
2-2 Oscillator Operation . . . . .	II-1	4-5 Frequency Calibration Adjustment . . . . .	IV-1
2-3 Output Level Meter Operation . . . . .	II-2	4-6 Output Level Meter Adjustment . . . . .	IV-2
2-4 Input Level Meter Operation . . . . .	II-2	4-7 Input Level Meter Adjustment . . . . .	IV-2
III CIRCUIT DESCRIPTION . . . . .	III-1	4-8 Replacement of Lamp R11 . . . . .	IV-2
3-1 General . . . . .	III-1	4-9 Intermittent Output . . . . .	IV-3
		V REPLACEABLE PARTS . . . . .	V-1
		5-1 Introduction . . . . .	V-1
		5-2 Ordering Information . . . . .	V-1

# LIST OF ILLUSTRATIONS

Number	Title	Page	Number	Title	Page
1-1	Model 205AG Audio Signal Generator . . . . .	I-1	3-1	Block Diagram . . . . .	III-1
2-1	Output Voltage Correction Factors when using Output Attenuators . . . . .	II-0	4-1	Top View Cabinet Removed . . . . .	IV-4
2-2	Input Level Meter Correction Curve . . . . .	II-3	4-2	Bottom View Cabinet Removed . . . . .	IV-5
			4-3	Schematic Diagram . . . . .	IV-6

# LIST OF TABLES

Number	Title	Page
4-1	Troubleshooting Chart . . . . .	IV-3
5-1	Replaceable Parts . . . . .	V-1

# SECTION I

## GENERAL DESCRIPTION

### 1-1 GENERAL

The Model 205AG Audio Signal Generator contains all the necessary instruments for accurate gain or frequency response measurements. Any desired frequency range within the range of 20 to 20,000 cycle/sec. is made available by the resistance-tuned audio oscillator within the instrument. In addition to the audio oscillator, two voltmeters are provided. One voltmeter measures input to and the second measures output from the device under test. An attenuator is provided to set the output voltage at any desired level. The output impedance can be changed by means of a selector switch to 50, 200, 600, or 5000 ohms.

This audio signal generator is typically used for amplifier gain measurements, network frequency response, source of voltage for distortion measurements, broadcast transmitter audio response, loud-speaker response, general laboratory application, and production testing.

### 1-2 INSPECTION

After the instrument is unpacked, it should be carefully inspected for damage received in transit. If any shipping damage is found, follow the procedure outlined in the "Claim for Damage in Shipment" page in this instruction manual.

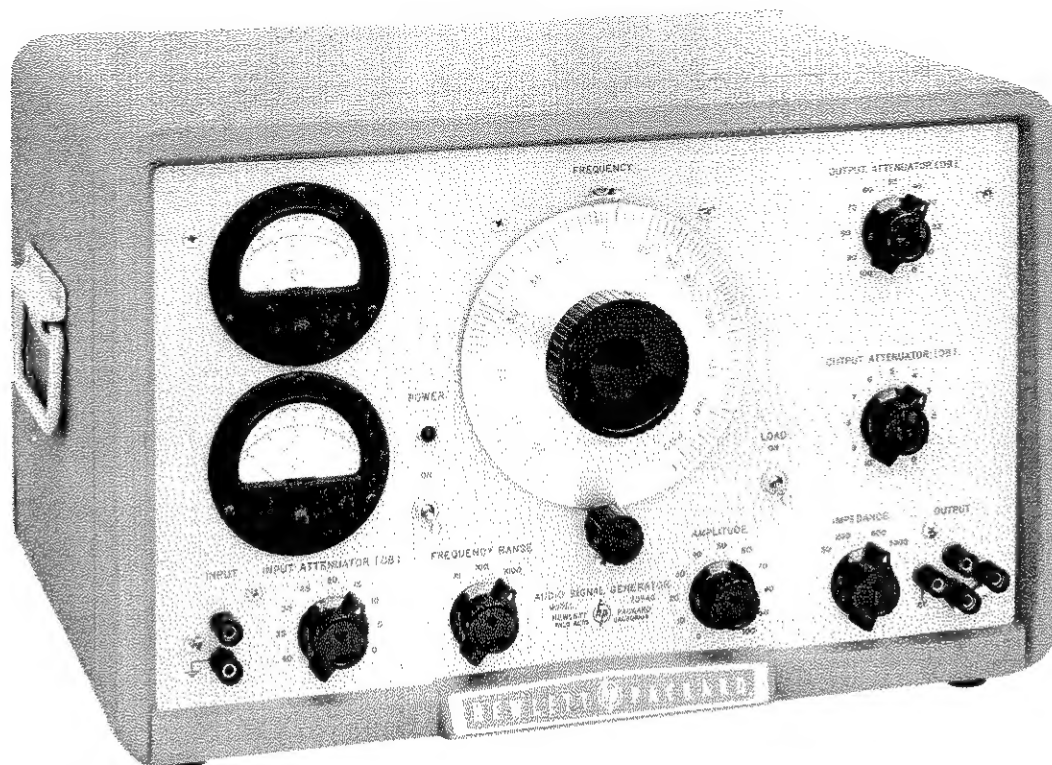


Figure 1-1. Audio Signal Generator

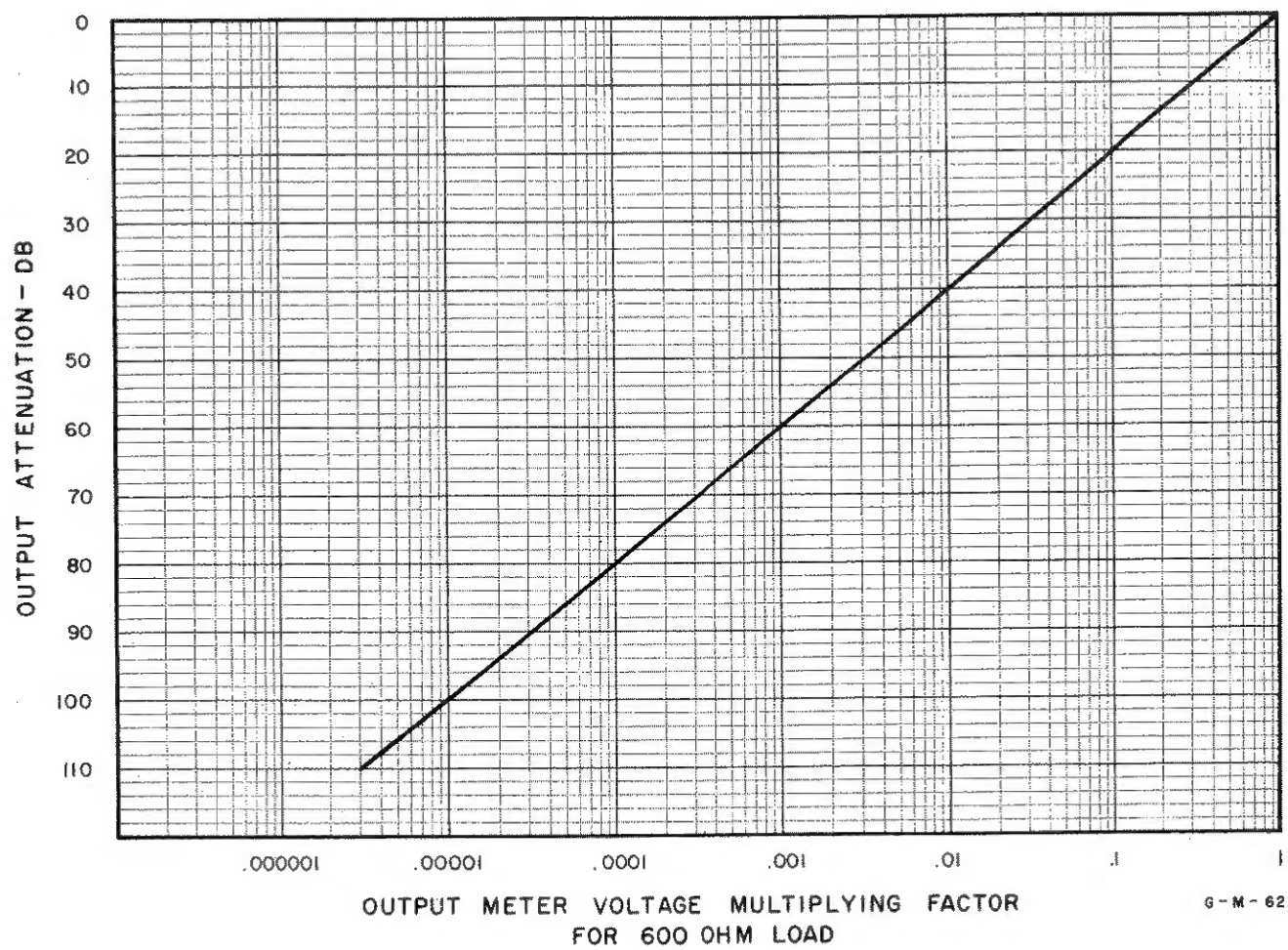


Figure 2-1. Output Voltage Correction Factors When Using Output Attenuators

## SECTION II

# OPERATING INSTRUCTIONS

### 2-1 CONTROLS AND TERMINALS

#### POWER ON

This switch controls the power supplied to the instrument from the power line.

#### LOAD ON

This switch is used to connect an internal load across the OUTPUT terminals.

#### INPUT

These terminals are the input for the audio frequency INPUT LEVEL vacuum tube voltmeter in the instrument.

#### INPUT ATTENUATOR (DB)

This switch is the range switch for the INPUT LEVEL meter and is calibrated in steps of 5 db from 0 to 40 db.

#### FREQUENCY RANGE

The position of this switch indicates the multiplying factor to be used with the frequency dial indication.

#### FREQUENCY Dial

This dial is calibrated in cycles per second. The output frequency is the frequency dial indication multiplied by the FREQUENCY RANGE switch position.

#### AMPLITUDE

This control adjusts the amplitude of oscillator voltage applied to the output amplifier. The calibration is in arbitrary units.

#### IMPEDANCE

This switch selects the instrument output impedance. The available impedances are 50, 200, 600, and 5000 ohms.

#### OUTPUT

The instrument output appears at four terminals. The terminal marked CT is the center tap of the line matching transformer. The  $\oplus$  terminal is connected to the chassis. The two vertically spaced terminals are connected to the line matching transformer through the IMPEDANCE switch. A balanced output is obtained from the vertically spaced terminals

and an unbalanced output may be obtained by connecting the  $\oplus$  terminal to one of the output terminals with the captive link provided.

#### OUTPUT LEVEL

This meter indicates the voltage at the output terminals when the IMPEDANCE switch is set at 600, output attenuators both at zero, and the instrument is loaded with the internal or an external 600 ohm load. Under other operating conditions the meter may be used as a monitor to insure constant output voltage.

#### INPUT LEVEL

This meter measures the voltage applied to the input terminals and the range of the meter is controlled by the INPUT ATTENUATOR (DB) range switch.

#### FUSE

The fuseholder, located on the back of the chassis, contains the power line fuse. Refer to the Table of Replaceable Parts for the correct fuse rating.

#### Power Cable

The three conductor power cable is supplied with a NEMA approved three-prong plug. The third conductor provides a chassis ground. An adapter may be obtained to permit use of this plug with two-conductor receptacles.

#### OUTPUT ATTENUATORS

These two attenuators are used to reduce the output level in one db steps to a maximum of 110 db below the output level indicated on the OUTPUT LEVEL meter.

### 2-2 OSCILLATOR OPERATION

The procedure for operating the Model 205AG Audio Signal Generator is as follows:

- a. Connect the instrument power cable to a 115/230 V alternating current power line and the output terminals to the equipment being tested. Set the IMPEDANCE switch to match the load. When the Signal Generator is operated into a high impedance

load, the Load Switch must be turned on, otherwise the Output Level Meter and the Attenuator indications will not be correct. The Load Switch should be off when the instrument is connected to loads within the range of the line matching impedances.

b. Turn the power switch to ON and allow approximately five minutes for the instrument to stabilize. Set the Freq. Range control and the frequency dial so that their indications when multiplied together equal the desired frequency. For example: Frequency dial indication 20, FREQUENCY RANGE X100,  $20 \times 100 = 2000$  cycles/second.

c. Set the output attenuators and the AMPLITUDE control to obtain the desired output level. Distortion in the output will be minimized by keeping the Output Level meter indication near maximum and reducing the output with the output attenuators.

### 2-3 OUTPUT LEVEL METER OPERATION

The Output Level meter is calibrated directly in output voltage and db above 1 milliwatt when the instrument is operating into a 600 ohm load and both output attenuators are set at zero.

With any matched load (50, 200, 600, or 5000 ohms) the output power in db above or below 1 milliwatt is equal to the Output Level Meter indication less the output attenuator settings. For example: an Output Level meter indication of +35 db and a total output attenuation of 45 db will produce an output level of -10 dbm into a matched load.

Figure 2-1 is a chart of meter voltage multiplying factors for any value of output attenuation. With the IMPEDANCE switch set at 600 ohms and an internal or external 600 ohm load, the output voltage will be the Output Level meter voltage indication multiplied by a factor obtained from Figure 2-1 opposite the total output attenuation. For example: with the output attenuators set for 40 db all Output Level meter indications should be multiplied by .01 to obtain the true output voltage into a 600 ohm load.

To obtain the true output voltage into a 50, 200 or 5000 ohm load the following factors must be applied to the true voltage across a 600 ohm matched load.

Load Impedance	600 Ohm Voltage Multiplying Factor
50	0.289
200	0.577
5000	2.89

For example: with an Output Level Meter indication of 40 volts and the output attenuators set at 40 db, we find from Figure 2-1 that the true output voltage into 600 ohms would be 40 volts multiplied by 0.01 or 0.4 volts. To convert this to a voltage across a 200 ohm matched load multiply by 0.577 or  $0.4 \times 0.577 = 0.2308$  volts.

### 2-4 INPUT LEVEL METER OPERATION

The Input Level meter is an independent audio frequency vacuum tube voltmeter, suitable for monitoring the output voltage of a device under test. The meter is calibrated in volts and db above 1 milliwatt in 600 ohms when the INPUT ATTENUATOR (DB) switch is on zero.

When making comparative measurements across a constant impedance the meter and INPUT ATTENUATOR (DB) switch will indicate directly the change in db in the circuit under test.

When using the Input Level meter to monitor a 600 ohm circuit, the power level in db above 1 milliwatt is equal to the meter indication plus the indication of the INPUT ATTENUATOR (DB) switch.

When making power measurements in circuits with impedances below 600 ohms, the absolute level in db above or below 1 milliwatt is equal to the level indicated on the meter plus the INPUT ATTENUATOR (DB) switch indication plus a correction factor for the circuit impedance. Figure 2-2 gives correction factors for impedances between 1 and 600 ohms.

The input voltage level for any range of the INPUT ATTENUATOR (DB) switch is the voltage indicated by the Input Level meter multiplied by the factor indicated below for the particular range of the INPUT ATTENUATOR (DB) switch in use.

INPUT ATTENUATOR (DB) Position	Meter Voltage Multiplying Factor
0	1
5	1.78
10	3.16
15	5.62
20	10
25	17.78
30	31.62
35	56.23
40	100

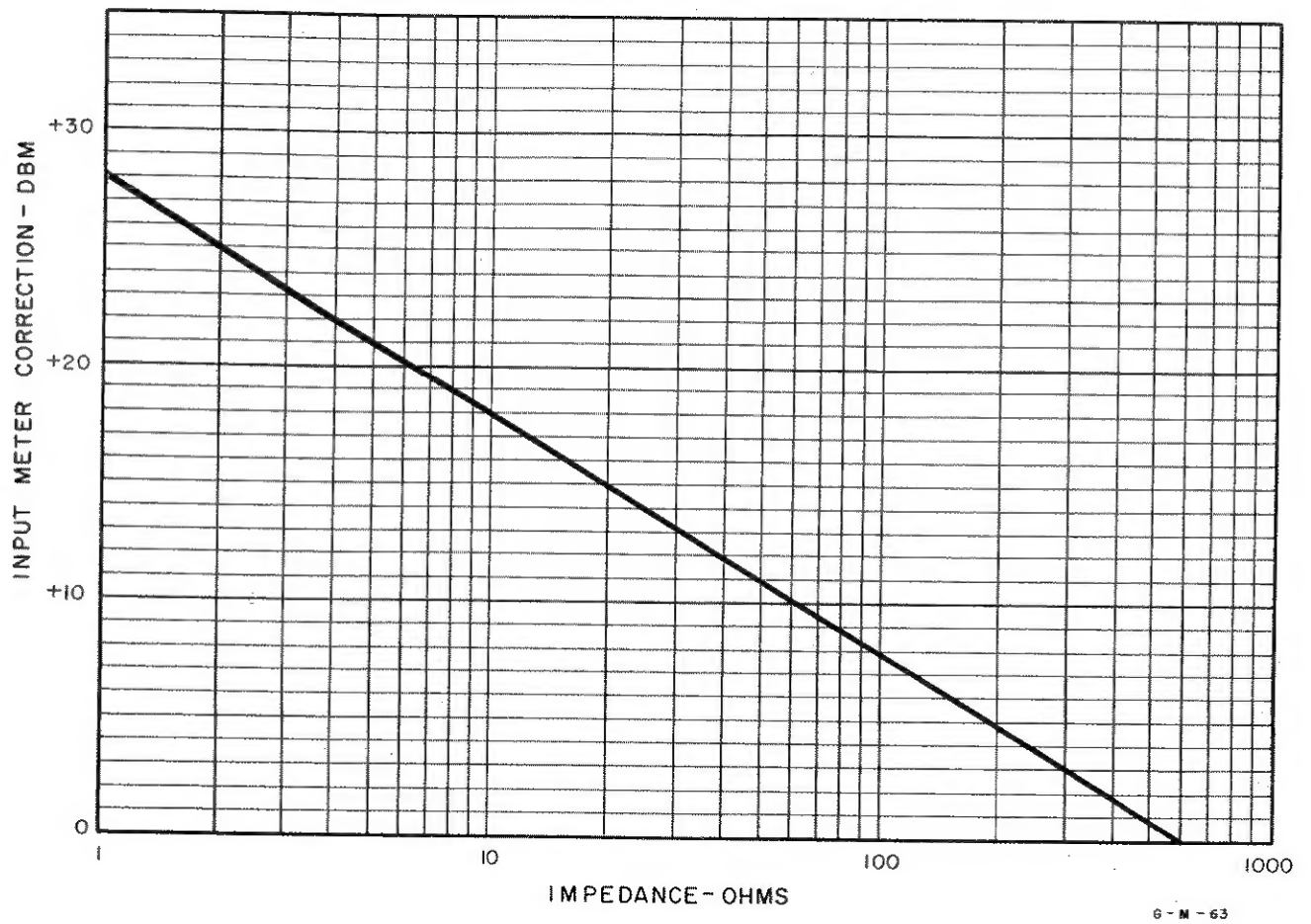


Figure 2-2. Input Level Meter Correction Curve

## SECTION III CIRCUIT DESCRIPTION

### 3-1 GENERAL

The Model 205AG Audio Signal Generator consists of an oscillator, an amplifier, output meter and attenuator, line matching transformer, and a conventional power supply (see Figure 3-1).

The oscillator section (tubes V1 and V2) is a resistance-tuned type circuit. Basically, this oscillator is a two-stage resistance-coupled amplifier which is caused to oscillate by the use of a positive feedback network. This network is a frequency-selective resistance-capacity combination which controls the frequency of oscillation. By using a variable tuning capacitor for the capacity of the network, it is possible to tune the oscillator over a wide 10:1 range; and by using a switching arrangement to select different values of resistance for the network, several ranges are given to the oscillator.

Negative feedback is used in the oscillator section in order to minimize distortion and to obtain a very high order of stability. The amount of negative feedback is determined by a resistance network, one element of which is non-linear (the 3-watt lamp in the cathode of V1). This element controls the amount of feedback in accordance with the amplitude of oscillation and consequently maintains the amplitude of

oscillation substantially constant over a wide frequency range. The negative feedback also keeps the operation of the system on the linear portion of the tube characteristic.

The amplifier section consists of a voltage amplifier tube directly coupled to a phase inverter which drives the push-pull output tubes. The tertiary winding on the output transformer provides negative feedback for the amplifier.

The output meter and attenuator section is made up of an average reading type voltmeter and two bridged T-type attenuators. The attenuators and voltmeter are connected between the output transformer secondary and the primary of the line matching transformer.

A full-wave rectifier and a dc milliammeter calibrated in volts and decibels make up the Output Level meter. The line matching transformer is used to change the 500 ohms line impedance to 50, 200, 600, or 5,000 ohms output impedance.

The Model 205AG also includes an Input Level meter which is of the average responding type. The meter consists of a two stage amplifier with negative feedback, a full-wave rectifier and a dc milliammeter calibrated in volts and decibels.

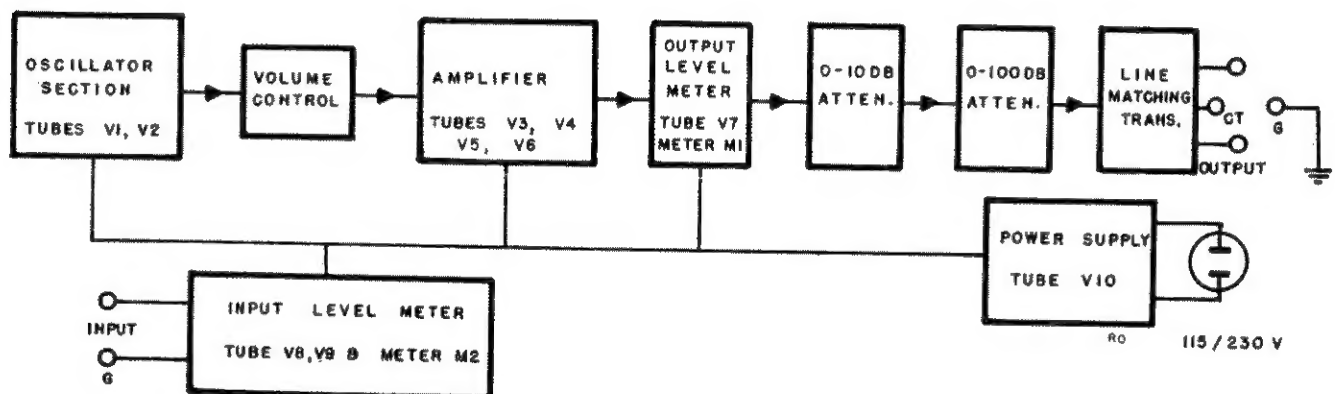


Figure 3-1. Block Diagram Model 205AG

## SECTION IV MAINTENANCE

### 4-1 CABINET REMOVAL

Remove four screws from the rear of the cabinet and remove the rear cover. Place instrument on its back, and loosen the two screws located on the underside of the front panel bezel. Free cabinet and lift from instrument.

### 4-2 TUBE REPLACEMENT

The tubes in this instrument may be replaced with any tube having EIA standard characteristics. Whenever a tube is replaced, with the exception of V7 or V8, the distortion should be measured to see that it does not exceed the specifications. When tubes V7 or V8 are replaced it may be necessary to adjust the zero setting of their respective meters.

### 4-3 DISTORTION

Excessive distortion may be caused by defective tubes, open by-pass capacitors, and low voltages.

### 4-4 CAPACITOR DRIVE LUBRICATION

The capacitor drive should be lubricated once a year. Remove the cover plate from the top of the capacitor shield. Put one drop of light oil on each of the bearings on the small gear shaft at the top of the drive. The capacitor ball bearings do not need lubrication.

### 4-5 FREQUENCY CALIBRATION ADJUSTMENT

The range switch resistors R1 to R6 inclusive in conjunction with the tuning capacitor assembly C1 and C2, determine the frequency of the oscillation of the unit and also affect the amplitude. If the output frequency is not within 2% of that indicated by the dial, or if the amplitude varies more than  $\pm 1/2$  db from 200 to 2000 cps, the following procedure is recommended.

#### NOTE

For all adjustments the output must be loaded with the internal load. Turn the LOAD switch ON.

The frequency calibration will be correct only when the shields around and above the main tuning capacitor are firmly in place.

Using a gentle airstream, blow out any dust that may be present on the tuning capacitor.

a. Check for proper setting of dial on shaft. At one end of the frequency dial will be either a small dot or an extra line. This should be under the indicator hairline when the tuning capacitor is at that end of its travel. This may be adjusted by loosening set screws on one side of the coupler behind the panel, then rotating the dial until correctly lined up.

Check and tighten all set screws in the dial drive mechanism.

b. Turn on the instrument and allow at least 30 minutes for it to warm up.

c. Set to X10 range and dial to 20. Set the output meter to 50 volts. Change dial setting to 200. The panel output meter should then read 50 volts  $\pm 2$  volts and the frequency should be 2000 cps  $\pm 2\%$ . If both frequency and amplitude are in error, adjust C1 and C22 for the best compromise between correct frequency and correct amplitude.

d. Check tracking of the rest of the frequency dial. If there is no constant error in tracking, proceed with the next step. If there is a constant error, proceed with one of the following methods, whichever is the easiest.

1. Loosen set screws and reset the dial to take the error into account, then repeat steps b and c. This method is best if the other ranges also have a constant error in the same direction.

2. Change the small padding resistors in series with the precision resistor on the range switch. Increasing the value of the resistor by 10,000 ohms will lower the frequency of the range approximately 1%; decreasing the value of this resistor will raise the frequency of the range. \* Retrace steps a through d.

e. When the X10 range has been properly adjusted, the other ranges may be adjusted as follows:

#### 1. X100 range

Change the padding resistor in series with the precision resistor. A change of 1000 ohms will change the frequency approximately 1% on this range. Then 20,000 cycles on the dial is corrected by varying C-7. A change of 50 to 200 pf is usually adequate.

#### 2. X1 range

An increase of 100K ohms in the padding resistor will decrease frequency approximately 1% on this range. There may be a small tracking error (less than 2%) at the top or the bottom of the X1 range. This is normal to the instrument and cannot be eliminated.

f. If satisfactory calibration cannot be obtained in the above manner, it may be necessary to return the instrument to an authorized repair station or the factory.

### 4-6 OUTPUT LEVEL METER ADJUSTMENT

The procedure for adjusting the Output Level meter is as follows:

a. With the instrument operating and Vol. control at zero, adjust the meter pointer to zero with zero adjustment screw on the meter.

b. Connect an accurate vacuum tube voltmeter across the 600 ohms output terminals with the 600 ohms internal load switched on. Set the instrument for 100 cycles/sec. output, zero attenuation, and adjust the Vol. control until the external voltmeter indicates 55 volts. Adjust the variable resistor R29 until the Output Level meter indicates exactly 55 volts. The resistor R29, which is reached through a hole in the back of the chassis, can be turned with a screwdriver.

\* Up to 1% change in frequency on any range may be made by adjusting only one of the two range resistor padders on that range. If a greater frequency change is needed, adjust both padders. If this is not done, the relative amplitude between ranges will be affected.

### 4-7 INPUT LEVEL METER ADJUSTMENT

This meter is adjusted as follows:

a. With the instrument operating, short circuit the Input Terminals. Adjust the meter pointer to zero with zero adjustment screw on the meter.

b. Connect the input terminals to the Output terminals and set the instrument controls as follows:

Control	Setting
INPUT ATTENUATOR (DB)	0
FREQUENCY RANGE	X10
FREQUENCY dial	40
LOAD	ON
IMPEDANCE	5000
OUTPUT ATTENUATOR (DB)	40
OUTPUT ATTENUATOR (DB)	6
AMPLITUDE	to obtain 53 v on OUTPUT LEVEL METER

The Input Level meter should indicate zero db with the controls set as above. If the meter indication is incorrect, adjust the variable resistor R47 to correct the meter indication. The variable resistor R47 is reached through a hole in the left side of the chassis. (Instrument removed from cabinet.)

c. After the zero db level is in adjustment, change the attenuators to 41 db and 51 db which will indicate + 5 db and -5 db respectively. If the meter tracking at these points is not satisfactory, then the 6H6 tube V9 should be replaced and the above adjustments repeated.

### 4-8 REPLACEMENT OF LAMP R11

The 3-watt lamp R11 is operated at a very low level and should have an almost infinite life. Therefore, the lamp should not be changed indiscriminately. However, should the lamp require changing, it is necessary to measure the ac voltage from the junction of R58 and C4 to the chassis with the new lamp in the circuit. This voltage should be measured with a high impedance vacuum tube voltmeter such as Hewlett-Packard Models 400C, 400D, or 410B.

To make this measurement and adjustment, the instrument must be removed from the cabinet. Set

the oscillator frequency to 1000 cycles/sec. and vary the resistor R19 so that 21 to 25 volts is obtained. The resistor R19 is mounted on the shield surrounding the Freq. Range Switch.

If the voltage cannot be brought within the 21 to 25 volts range by means of R19, the new lamp should be rejected in favor of another.

ing of the 3-watt oscillator lamp (R11) is a reliable indication of a short in trimmer capacitor C1 or in the first two sections of the main tuning capacitor. If these symptoms occur, search out and clear the short with a weak air jet or other means. Do not bend the capacitor plates because bending capacitor plates will destroy the frequency calibration.

A short in the back two sections of the main tuning capacitor will prevent the circuit from oscillating. Any such short should be cleared as explained above.

#### 4-9 INTERMITTENT OUTPUT

"Jumpy" or intermittent output accompanied by flash-

TABLE 4-1. TROUBLESHOOTING CHART

The following is a listing of possible symptoms, causes and remedies

SYMPTOMS	CAUSES	REMEDIES
Instrument inoperative (Indicator lamp won't light, no audio output)	Blown fuse.	Clear short circuit and replace fuse.
Instrument inoperative (Indicator lamp lights, no audio output)	Defective tube. Check the 5U4GA/B tube first.	Replace tube.
	Short circuit in DC power circuit capacitor.	Replace capacitor.
	Short circuit in C2 (two rear sections)	Clear the short circuit as outlined in Paragraph 4-9.
Intermittent output	Capacitors C3, C4, C5, C8 or C9 intermittently open.	Replace capacitor.
	Short circuit in C2 (two front sections) or C1.	Clear the short circuit as outlined in Paragraph 4-9.
Output Level Meter inoperative.	6H6 tube V7 defective.	Replace tube.
Excessive distortion.	Defective tube.	Replace tube.
	Open circuit in capacitor C10 abc, C15, C16, C17, or C18.	Replace capacitor.
	Defective output or line matching transformer	Replace transformer.

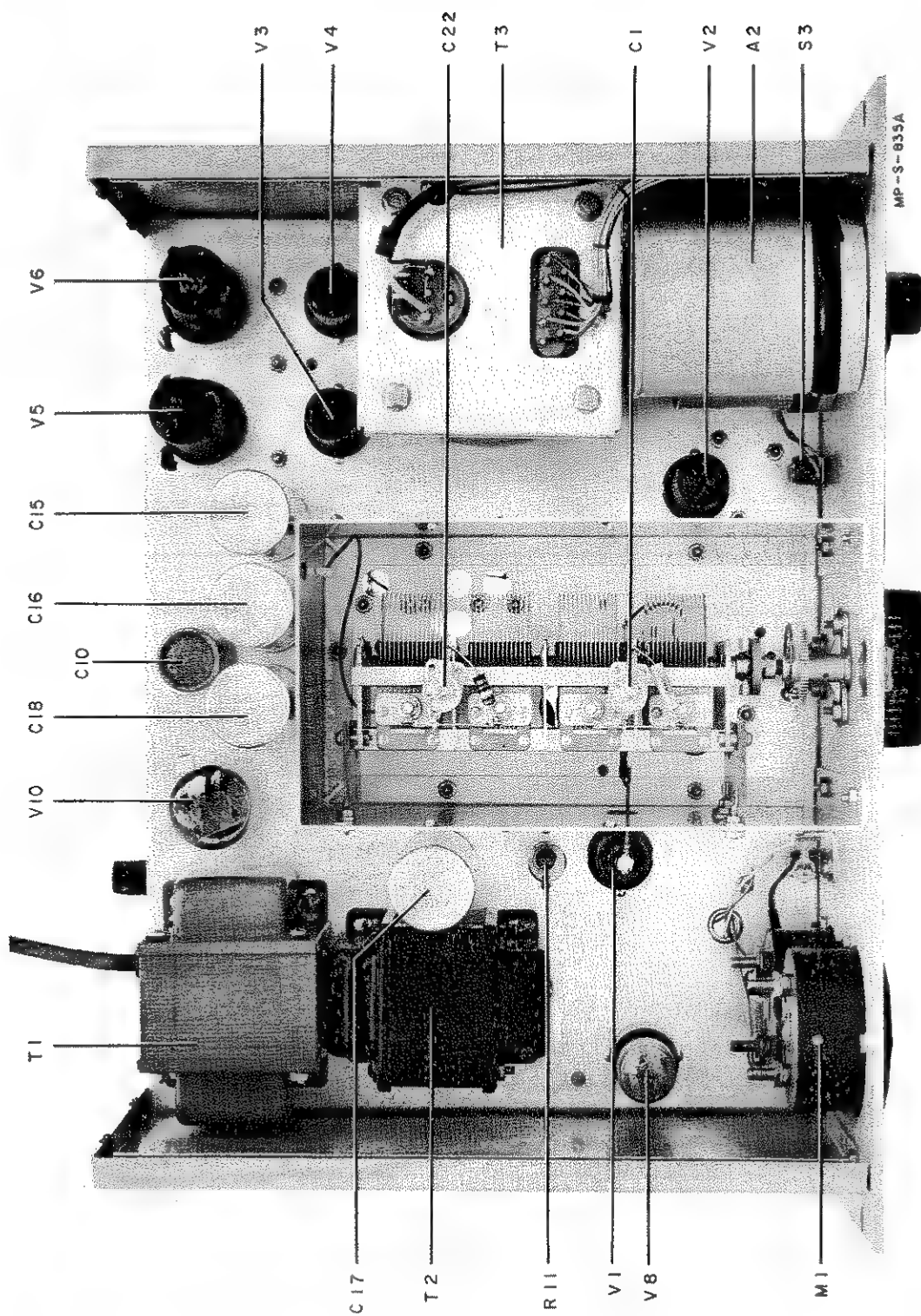


Figure 4-1. Model 205AG Top View Cabinet Removed

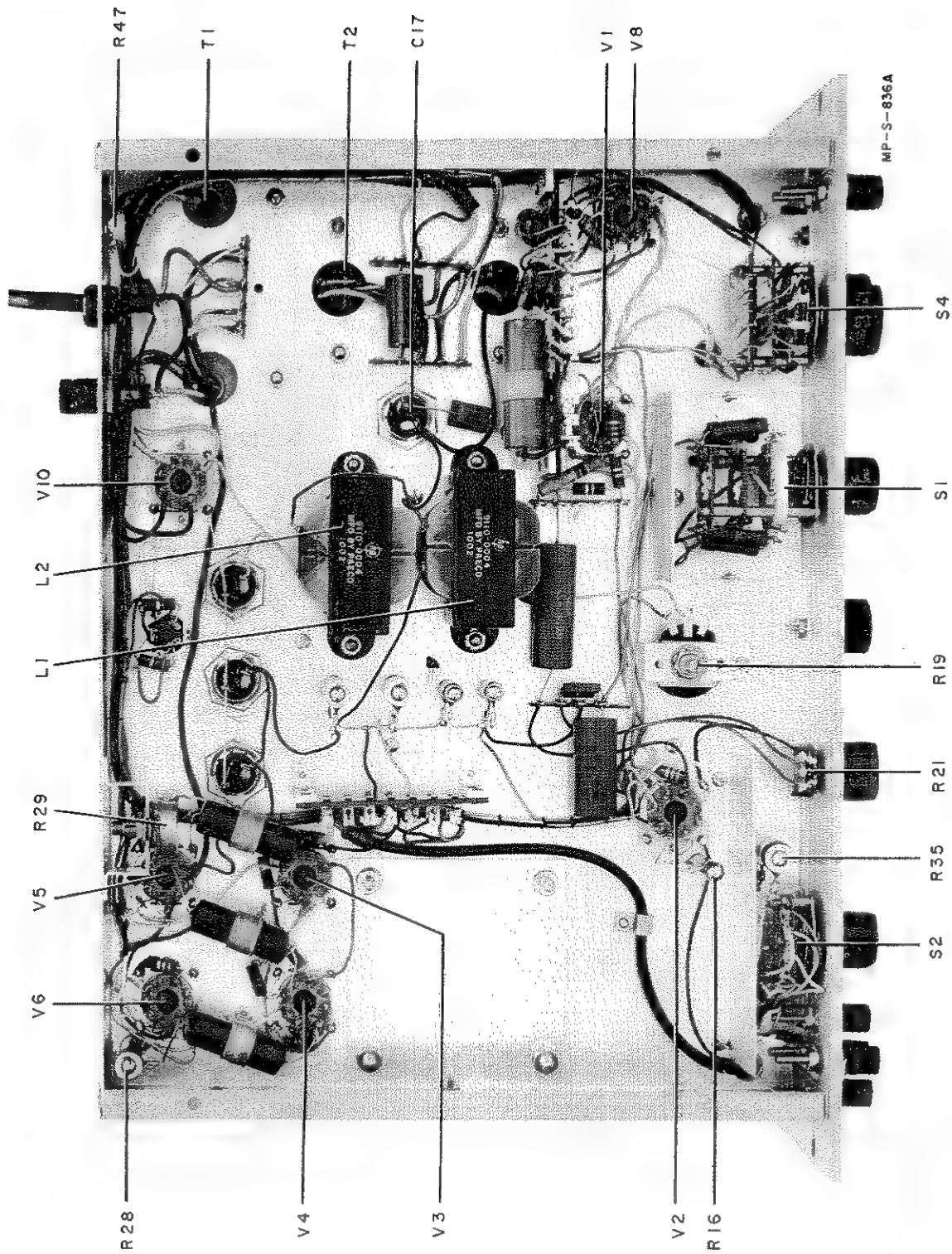


Figure 4-2. Model 205AG Bottom View Cabinet Removed



Figure 4-3. Model 205AG Audio Signal Generator

# SECTION V

## REPLACEABLE PARTS

### 5-1 INTRODUCTION

This section contains information for ordering replacement parts for the Model 205AG Audio Signal Generator.

Table 5-1 lists replaceable parts in alpha-numerical order of their reference designators. Detailed information on a part used more than once in the instrument is listed opposite the first reference designator applying to the part. Other reference designators applying to the same part refer to the initial designator. Miscellaneous parts are included at the end of the list. Detailed information includes the following:

- Reference designator.
- Full description of the part.
- Manufacturer of the part in a five-digit code; see list of manufacturers in appendix.
- Hewlett-Packard stock number.
- Total quantity used in the instrument (TQ col).
- Recommended spare quantity for complete maintenance during one year of isolated service (RS col).

### 5-2 ORDERING INFORMATION

To order a replacement part, address order or inquiry either to your authorized Hewlett-Packard sales office or to

**CUSTOMER SERVICE**  
Hewlett-Packard Company  
395 Page Mill Road  
Palo Alto, California,

or, in Western Europe, to

Hewlett-Packard S. A.  
Rue du Vieux Billard No. 1  
Geneva, Switzerland.

Specify the following information for each part:

- Model and complete serial number of instrument.
- Hewlett-Packard stock number,
- Circuit reference designator.
- Description.

To order a part not listed in Table 5-1, give a complete description of the part and include its function and location.

Table 5-1. Replaceable Parts (Sheet 1 of 7)

Ckt Ref	Description	Mfr *	Ⓢ Stock No.	TQ*	RS*		
A1	Attenuator, output, complete	28480	2AG-34	1	1		
	Assembly, attenuator: 10 steps, 1 db/step	28480	2AG-34-10				
A2	Assembly, attenuator: 10 steps, 10 db/step	28480	2AG-34-100				
C1	Capacitor: variable, ceramic, 7-45 pf, 500 vdcw	72982	0130-0001	1	1		

\* See introduction to this section

Table 5-1. Replaceable Parts (Sheet 2 of 7)

Ckt Ref	Description	Mfr *	Ⓢ Stock No.	TQ*	RS*		
C2	Capacitor: variable, air, 12.4-535 pf (tuning capacitor)	76854	0121-0004	1	1		
C3	Capacitor: fixed, paper, 0.5 $\mu$ f $\pm$ 10%, 400 vdcw	14655	0160-0024	2	1		
C4	Capacitor: fixed, electrolytic, 10 $\mu$ f $\pm$ 50%, 450 vdcw	37942	0180-0005	1	1		
C5	Capacitor: fixed, paper, 0.25 $\mu$ f $\pm$ 10%, 400 vdcw	56289	0160-0018	1	1		
C6	Not assigned						
C7	Capacitor: fixed, mica, 220 pf $\pm$ 10%, 500 vdcw Optimum value selected at factory. Average value shown.	76433	0140-0031	1	1		
C8,9	Capacitor: fixed, paper, 0.1 $\mu$ f $\pm$ 10%, 600 vdcw Optimum value selected at factory. Average value shown.	56289	0160-0001	2	1		
C10 ABC	Capacitor: fixed, electrolytic, 3 sections, 10 $\mu$ f/sect., 450 vdcw	37942	0180-0016	1	1		
C11	Not assigned						
C12,13	Capacitor: fixed, paper, 0.047 $\mu$ f $\pm$ 10%, 600 vdcw	56289	0160-0005	2	1		
C14	Same as C3						
C15 thru C18	Capacitor: fixed, paper, 4 $\mu$ f $\pm$ 10%, 600 vdcw	72758	0160-0077	4	1		
C19	Capacitor: fixed, electrolytic 20 $\mu$ f, 50 vdcw	37942	0180-0026	1	1		
C20	Capacitor: fixed, titanium dioxide, 1.5 pf $\pm$ 20%, 500 vdcw Part of S1	78488	0150-0011	1	1		
C21	Capacitor: fixed, ceramic, 39 pf $\pm$ 5%, 500 vdcw	96095	0150-0002	1	1		
C22	Capacitor: fixed, ceramic, 1.5-7 pf, 500 vdcw	72982	0130-0003	1	1		

\* See introduction to this section

Table 5-1. Replaceable Parts (Sheet 3 of 7)

Ckt Ref	Description	Mfr *	Stock No.	TQ*	RS*		
C23	Capacitor: fixed, mica, 150 pf, 500 vdcw Optimum value selected at factory. Average value shown.	76433	0140-0055	1	1		
C24	Capacitor: fixed, ceramic, 5 pf, 500 vdcw Optimum value selected at factory. Average value shown.	00853	0150-0008	1	1		
CR1 thru CR6	Diode, germanium, IN90	73293	1910-0004	0	6		
F1	Fuse, cartridge: 1.6 amp, for 115 volts operation	71400	2110-0005	1	10		
	Fuse, cartridge: 0.8 amp, for 230 volts operation	75915	2110-0020				
I1	Lamp, incandescent: 6-8v, 2 pin base, GE #12	24455	2140-0012	1	1		
L1,2	Reactor: 6h @125 MA, 240 ohms	28480	9110-0004	2	1		
M1	Meter, OUTPUT LEVEL	28480	1120-0003	1	1		
M2	Meter, INPUT LEVEL	28480	1120-0002	1	1		
P1	Cable, power	70903	8120-0015	1	1		
R1	Resistor: fixed, deposited carbon, 8.3 megohms $\pm 1\%$ , 1 W (part of S1)	19701	0730-0136	2	1		
R2	Resistor: fixed, deposited carbon, 830,000 ohms $\pm 1\%$ , 1 W (part of S1)	19701	0730-0102	2	1		
R3,4	Resistor: fixed, deposited carbon, 830,000 ohms $\pm 1\%$ , 1 W (part of S1)	19701	0730-0063	2	1		
R5	Same as R2 (part of S1)						
R6	Same as R1 (part of S1)						
R7 thru R9	Not assigned						
R10	Resistor: fixed, wirewound, 3000 ohms $\pm 5\%$ , 5 W	75042	0812-0010	1	1		

\* See introduction to this section

Table 5-1. Replaceable Parts (Sheet 4 of 7)

Ckt Ref	Description	Mfr *	Stock No.	TQ*	RS*		
R11	Lamp, incandescent, 120 V, 3 W candelabra screw base	24455	2140-0001	1	1		
R12	Resistor: fixed, composition, 33,000 ohms $\pm 10\%$ , 1 W	01121	0690-3331	1	1		
R13, 14	Resistor: fixed, composition, 100,000 ohms $\pm 10\%$ , 1 W	01121	0690-1041	2	1		
R15	Resistor: fixed, composition, 560,000 ohms $\pm 10\%$ , 1 W	01121	0690-5641	3	1		
R16	Resistor: fixed, wirewound, 800 ohms $\pm 10\%$ , 10 W	35434	0816-0004	1	1		
R17	Resistor: fixed, wirewound, 25,000 ohms $\pm 10\%$ , 10 W	35434	0816-0009	1	1		
R18	Resistor: fixed, wirewound, 10,000 ohms $\pm 10\%$ , 10 W	35434	0816-0008	1	1		
R19	Resistor: variable, wirewound, linear taper, 1000 ohms $\pm 10\%$ , 2 W	71450	2100-0004	1	1		
R20	Resistor: fixed, wirewound, 10,000 ohms $\pm 10\%$ , 20 W	35434	0819-0004	1	1		
R21	Resistor: variable, composition, 25,000 ohms $\pm 20\%$ , 1/3 W	71450	2100-0009	1	1		
R22	Resistor: fixed, composition, 1 megohm $\pm 10\%$ , 1 W	01121	0690-1051	1	1		
R23	Resistor: fixed, composition, 8200 ohms $\pm 10\%$ , 1 W	01121	0690-8221	1	1		
R24	Resistor: fixed, composition, 1.2 megohms $\pm 10\%$ , 1 W Optimum value selected at factory. Average value shown.	01121	0690-1251	1	1		
R25	Resistor: fixed, composition, 22,000 ohms $\pm 5\%$ , 1 W	01121	0689-2235	2	1		
R26, 27	Same as R15						
R28	Resistor: fixed, wirewound, 500 ohms $\pm 10\%$ , 20 W	35434	0819-0005	1	1		
R29	Resistor: variable, composition, linear taper, 20,000 ohms	71590	2100-0161	1	1		

\* See introduction to this section

Table 5-1. Replaceable Parts (Sheet 5 of 7)

Ckt Ref	Description	Mfr *	Stock No.	TQ*	RS*		
R30	Resistor: fixed, deposited carbon, 18,000 ohms $\pm 1\%$ , 1/2 W	19701	0727-0170	1	1		
R31, 32	Resistor: fixed, composition, 10,000 ohms $\pm 10\%$ , 1 W	01121	0690-1031	2	1		
R33	Resistor: fixed, wirewound, 2500 ohms $\pm 10\%$ , 20 W	35434	0819-0002	1	1		
R34	Not assigned						
R35	Resistor: fixed, wirewound, 600 ohms $\pm 1\%$ , 20 W	83777	0817-0001	1	1		
R36 thru R44	Resistors: part of Input Attenuator Assembly (not separately replaceable)						
R45	Resistor: fixed, composition, 1 megohm $\pm 10\%$ , 1/2 W	01121	0687-1051	2	1		
R46	Resistor: fixed, wirewound, 1000 ohms $\pm 10\%$ , 1 W	75042	0813-0001	1	1		
R47	Resistor: variable, wirewound, 500 ohms	42190	2100-0022	1	1		
R48	Resistor: fixed, composition, 1000 ohms $\pm 10\%$ , 1 W	01121	0690-1021	1	1		
R49	Same as R45						
R50	Resistor: fixed, composition, 150,000 ohms $\pm 10\%$ , 1 W	01121	0690-1541	1	1		
R51	Resistor: fixed, composition, 270,000 ohms $\pm 10\%$ , 1 W	01121	0690-2741	1	1		
R52	Resistor: fixed, composition, 33,000 ohms $\pm 10\%$ , 1 W	01121	0690-3331	1	1		
R53	Resistor: fixed, composition, 18,000 ohms $\pm 10\%$ , 1 W	01121	0690-1831	1	1		
R54	Not assigned						
R55	Same as R25						
R56	Not assigned						
R57	Resistor: Optimum value selected at factory						

\* See introduction to this section

Table 5-1. Replaceable Parts (Sheet 6 of 7)

Ckt Ref	Description	Mfr *	Stock No.	TQ*	RS*		
R58	Resistor: fixed, composition, 27,000 ohms $\pm 10\%$ , 1 W Optimum value selected at factory. Average value shown.	01121	0690-2731	1	1		
R59	Resistor: fixed, wirewound, 7 ohms $\pm 10\%$ , 2 W	12697	0813-0002	1	1		
R60	Resistor: fixed, composition, 4700 ohms $\pm 10\%$ , 2 W	01121	0693-4721	1	1		
R61	Resistor: fixed, composition, 18 ohms $\pm 10\%$ , w W Optimum value selected at factory. Average value shown.	01121	0693-1801	1	1		
R62, 63	Resistor: fixed, composition, 680 ohms $\pm 10\%$ , 1/2 W	01121	0687-6811	2	1		
S1	Range switch assembly	28480	2AG-19WB	1	1		
S2	Impedance switch assembly: includes S3	28480	2G-39	1	1		
S3	Switch, toggle: SPST	04009	3101-0001	2	1		
S4	Input attenuator assembly: include R36 thru R44	28480	2G-53	1	1		
S5	Same as S3						
T1	Transformer, power	28480	9100-0041	1	1		
T2	Transformer, audio output	28480	9120-0009	1	1		
T3	Transformer, impedance matching	28480	9120-0020	1	1		
V1	Tube, electron: 6J7	80131	1923-0032	1	1		
V2	Tube, electron: 6F6	80131	1923-0031	1	1		
V3	Tube, electron: 6SQ7	80131	1939-0005	1	1		
V4	Tube, electron: 6J5	80131	1921-0008	1	1		
V5, 6	Tube, electron: 6L6	80131	1923-0034	2	2		
V7	Not assigned						
V8	Tube, electron: 6SN7GT	80131	1932-0025	1	1		
V9	Not assigned						
V10	Tube, electron: 5U4GA/B	80131	1930-0008	1	1		

\* See introduction to this section

Table 5-1. Replaceable Parts (Sheet 7 of 7)

Ckt Ref	Description	Mfr *	Stock No.	TQ*	RS*		
	<u>MISCELLANEOUS</u>						
	Binding Post Assembly: black	28480	AC-10C	2	1		
	Binding Post Assembly: red	28480	AC-10D	4	1		
	Conversion kit (conversion of cabinet mount to rack mount in the field)	28480	35F-95A				
	Fuseholder	75915	1400-0084	1	1		
	Jewel, pilot light	72765	1450-0020	1	1		
	Knob: vernier	28480	G-74F	1	0		
	Knob: AMPL.	28480	G-74K	1	0		
	Knob: INPUT DB, FREQ. RANGE, IMPEDANCE, 0-10 DB (lower attenuator) 0-100 DB (upper attenuator)	28480	G-74N	5	0		
	Lampholder, 2 pin base	72765	1450-0022	1	1		
	Lampholder: (for R11)	72765	1450-0013	1	1		
	Spring, vernier drive disc	28480	1460-0019	1	0		
	Vernier drive disc on shaft	28480	G-14A	1	0		
	Vernier drive disc	28480	G-14B	1	0		
	Window dial	28480	G-99K	1	0		

\* See introduction to this section

# hp MANUAL CHANGES

MODEL 205AG

AUDIO SIGNAL GENERATOR

Manual Serial Prefixed: 012-  
Manual Printed 5/61

To adapt this manual to instruments with other serial prefixes check for errata below, and make changes shown in tables.

Instrument Serial Prefix	Make Manual Changes	Instrument Serial Prefix	Make Manual Changes
012	1	All	6
151	2		
All	3, 4		
231	5		

## CHANGE #1

Paragraph 4-7, step b,  
Change the setting of LOAD switch to OFF.

Paragraph 4-7, line #5 of step c,  
Change to read: "diodes CR1, CR2, CR3, and CR4 should be replaced and the above adjustments repeated."

## CHANGE #2

The 205AG contains two terminal boards on which are mounted a variety of small parts. The boards used in earlier instruments (24-terminal board Stock No. 2G-75A; 14-terminal board Stock No. 2G-75B) utilized solder lugs to mount parts. The boards used in later issue instruments, having serial prefix number 151-(large board Stock No. 2G-75C; small board Stock No. 2G-75D) are directly interchangeable, and the etched-circuit board will be supplied as a replacement part for both types.

## CHANGE #3

Figure 4-3,  
Change V3 to read, "6SQ7".

## CHANGE #4

Table of Replaceable Parts  
Was C19, Capacitor - fixed, 20  $\mu$ fd, 50 vdc  
Mfr., 37942,  $\Phi$  Stock No. 0180-0026, TQ-1, RS-1.  
  
Now C19, Capacitor - fixed, 20  $\mu$ fd, 50 vdc  
Mfr., 56289,  $\Phi$  Stock No. 0180-0049, TQ-1, RS-1.

## CHANGE #5

Table of Replaceable Parts  
Delete the following:  
Spring, Compression, Stock No. 1460-0019, 1 ea  
Vernier Disc, Stock No. G-14A, 1 ea  
Vernier Disc, Stock No. G-14B, 1 ea  
  
Add the following:  
Disc Ass'y Vernier Drive, Stock No. G-14J, Mfr. 28480, TQ-1  
Bearing Capacitor Drive, Stock No. G-36J, Mfr. 28480, TQ-1  
Spring Thrust, Stock No. G-91A, Mfr. 28480, TQ-1

## CHANGE #6

Table of Replaceable Parts  
Was Attenuator, output, complete  $\Phi$  Stock No. 2AG-34  
Now Attenuator, output, complete  $\Phi$  Stock No. 2AG-34A  
  
Was Assembly, attenuator: 10 steps 1db/step  $\Phi$  Stock No. 2AG-34-10  
Now Assembly, attenuator: 10 steps 1db/step  $\Phi$  Stock No. 2AG-34A-10  
  
Was Assembly, attenuator: 10 steps 10db/step  $\Phi$  Stock No. 2AG-34-100  
Now Assembly, attenuator: 10 steps 10db/step  $\Phi$  Stock No. 2AG-34A-100